Use of Mapping Skills, Remote Sensing and GIS to Study the Impact of Land-Use/Land-Cover Change on the Environment

By

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Abstract

It is important for today's teachers to learn to use different types of technology in the classroom, and NASA's remote sensing technology is available for use by all teachers and students. Remote sensing deals with the acquisition of data using techniques that do not require actual contact with the object or area being observed. Satellite imagery has become part of our lives as we all make use of weather and communication satellites daily. The GLOBE (Global Learning and Observation to Benefit the Environment) Program uses Landsat images of the area around GLOBE schools to define the type of Land Cover (urban, vegetation or water) that predominates in their neighborhoods. However, a need to develop basic map reading skills is essential. Many students, as well as their teachers may have had little experience at interpreting city map, state road maps, world atlases, topographic maps, or aerial photographs. Students need to develop skills, which will enable them to find the same ground location on a variety of images and maps. We propose to introduce educators, and their students to basic mapping skills, remote sensing techniques and Geographic Information Systems (GIS), and their applications to studies of the Earth and the environment. As an evaluation tool, teachers would design a tutorial that could be used by their students and others, at any locality, which would take them through the map interpretation process step by step from map basics to interpretation of NASA satellite images of their area or any other locale of interest. At the core of this project are the directions the teachers and their students need to follow to collect and compile a data set for their own school neighborhood using mapping skills, satellite images and GIS maps. Topics will be covered in hands-on inquiry-based classes, which would include practical assignments, field excursions, computer-based remote sensing and GIS mapping analysis and how these data are applicable to Earth and environmental science. Requirements, for each teacher before beginning the project would include a day of technology training in the computer lab. Here their basic computer skills will be assessed. A follow up day of technology training would be given at the end of the project. Additional assistance would be available to any teacher who feels he/she needs more instruction.

Background and Overview

To do this project we would select twelve teachers from our bank of approximately 350 GLOBE trained teachers. GLOBE teachers have already had some experience using scientific protocols related to remote sensing and Land Cover, so we would have that as a foundation to build on. Having trained this many teachers in scientific protocols, we begin to see that there is a need to give them more introductory or rudimentary training in how mapping skills evolve. We would start by giving them a brief history of how and why man first started developing maps, from early caveman marking the migration routes of animals they hunted on the caves of walls, to the sophisticated methods we use today. This would develop, in students, an appreciation for the problems and frustrations early mapmakers faced, and give them a sense of

awe of what astronomical strides we have made. Also, it would provide an understanding of how maps, Landsat images and Geographic Information Systems are linked.

The first part of our three-year effort would be to focus on teachers of children and young adults in grades 6-12. The El Paso area school systems have approximately 150,000 students, of which about 80% are minorities. Our objective would be to train a significant number of teachers, in how to interpret different types of maps, satellite images and GIS data at a moderate level. We would select and train 15 exceptional middle and high school teachers, from El Paso's three largest school districts, and two mentor teachers to accomplish this. Mentor teachers are experienced professional development trainers that are temporarily on a 5 year release from classroom duties to provide staff development to middle and high school science and math teachers. The mentor teachers and the geology department faculty would work together with these 15 GLOBE-certified teachers, to train them, and through them their students. This pyramid scheme would enable a small number of local experts to impact thousands of students. On the average a teacher has 150 students during the school day. During the first year alone, approximately 2250 students would benefit from being exposed to this cutting edge technology. The ultimate goal would be to educate a larger number of students about NASA and GIS technology and their many applications and to fill the university pipeline with such students.

El Paso, Texas has a very unique geographic location. The city, with its population of about 600,000 sits across the Rio Grande River from Juarez, Mexico, which has a population of approximately 1.5 million. The Franklin Mountains, which trend north south, bisect the town. Any research done by El Paso students and teachers has to take into account the unique geography and the environmental impact of both cities.

Implementation Plan

The 15 teachers along with the 2 mentor teachers would attend five all day workshops, that would be scheduled for the third Saturday of each month for 5 months. The training sessions would begin with a day spent in the computer lab where their computer skills would be assessed. The need for this became apparent when we found that a large number of teachers (an alarming seventy percent) who signed up for GLOBE training reported they have little or no Internet experience. Here, if needed, they would be taught basic computer skills and given instruction on how to create a web page for their future tutorial, and any lesson plans they generate during the training. During the second session the teachers would analyze sets of maps (city and state road maps, topographic maps, world atlases and aerial photographs). They would assess the usefulness of each, and create an exercise that would highlight each map type. The third session would focus on the physics of remote sensing and the mechanics of Multispec; the image processing software used by the GLOBE Program. The forth session would introduce the teachers to GIS applications. The geographic information systems that allow the user to bring all types of data together based on the geographic and locational component of the data; but unlike a static paper map GIS can display many layers of information that would be useful. Mapping and geographic analysis are not new, but GIS performs these tasks better and faster than do the old manual methods. The fifth session will be spent in the computer lab again learning to manipulate all the new technology to which they were introduced. A sixth session will be added for those who feel they need additional assistance. The end product of these sessions would be a tutorial that they or any other teacher who has computer access in their classroom, would be able to use.

Conclusions

The chief objectives will be to train teachers and through them their students in NASA technology (satellite imagery) and merge this with GIS (geographic information systems) to gain and use knowledge about the Earth's air, land, water and life. If we improve teacher and student understanding of the natural processes that govern the global environment, they will better be able to assess the effects of human activities on these

processes. It is necessary to enhance teacher knowledge and skills in technology, if we hope to achieve this goal and obtain positive student outcomes. We need to introduce technology to student learning by pointing out its use in practical applications. By providing interesting experiences in science and technology we would promote interest in careers in these areas. By introducing it in areas such as El Paso we increase the participation of underrepresented groups. The least we could hope to accomplish would be a more informed citizenry.